

**Larry D. Bowers, Ph.D.**  
Senior Managing Director  
United States Anti-Doping Agency  
Colorado Springs, CO 80906  
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**Education:**

Franklin and Marshall College, Lancaster, PA. B.A. (Chemistry)  
University of Georgia, Athens, GA. Ph.D. (Chemistry)  
University of Oregon Health Sciences Center, Portland, OR. Postdoctoral study

**Experience:**

United States Anti-Doping Agency  
SENIOR MANAGING DIRECTOR, TECHNICAL AND INFORMATION RESOURCES, September, 2000.  
Indiana University Purdue University at Indianapolis  
PROFESSOR, Department of Pathology and Laboratory Medicine, 1992-2000.  
DIRECTOR, Athletic Drug Testing and Toxicology Laboratory, 1992-2000.  
PROFESSOR, Department of Chemistry, Purdue University School of Science at Indianapolis, 1993-2000.  
Visiting Associate Professor, Cornell University, Equine Drug Testing and Toxicology Mass Spectrometry Facility, March - June, 1987.  
University of Minnesota, 1978-1992.  
PROFESSOR, Department of Laboratory Medicine and Pathology, 1988 - 1992.  
ADJUNCT PROFESSOR, Department of Chemistry, 1984-1992  
Facility manager, Health Sciences Mass Spectrometry Resource, 1981-1992  
Member, University of Minnesota University-Industry Cooperative Research Center for Biocatalytic Process Technologies, 1984-1992

Postdoctoral Training, University of Oregon Health Sciences Center

**Service Responsibilities:**

Director, Athletic Drug Testing and Toxicology Laboratory, Indiana University (1992-2000).  
Assistant Director, Clinical Chemistry Section, University of Minnesota (1988-1992)  
Director, Drug Analysis Laboratory, Clinical Chemistry Section, University of Minnesota (1980-92).

**Distinctions:**

World Anti-Doping Agency  
Member, Independent Observer team, Sydney Olympic Games, 2000  
Member, Standards and Harmonization Committee, 2000 – 2002  
Chairman, Laboratory Harmonization and Quality Assurance Subcommittee, 2001 – present  
Invited Panel Member, Workplace Urine Specimen Validity Testing Colloquium. Federal Aviation Administration (FAA)/ Civil Aerospace Medical Institute (CAMI), February, 2003.  
Member, Working Group on Identification of Substances by GC/MS, LC/MS, and MS/MS. US Substance Abuse and Mental Health Services Administration (SAMHSA), September, 2000.

Member, US Food and Drug Administration, Medical Devices Advisory Committee, 2003–present.  
(Consultant, 2000-2003)

Chairman, Subcommittee on GC/MS Standards, National Committee for Clinical Laboratory Standards, 1995–present. Developed document C43-A, "Gas Chromatography/Mass Spectrometry (GC/MS) Confirmation of Drugs; Approved Guideline."

Deputy Director, Anti-Doping Laboratory, Pan American Games, Montreal, Quebec, Canada, July 1999.

Deputy Director, Athletic Drug Testing Laboratory, XXV Olympic Games, Atlanta, GA, July 1996.

American Board of Clinical Chemistry – Certificate in Toxicological Chemistry #101, 1994; Certificate in Clinical Chemistry #562, 1979.

Laboratory Director Certificate of Qualification (#B10438), New York State Department of Health, 1994-2000.

### ***Clinical Chemistry***

Associate Editor, Toxicology/Therapeutic Drug Monitoring, 1994-2000  
Board of Editors, 1988-1994, 2000-present

Faculty, Advanced Analytical Techniques, Advanced Toxicology Workshop, American Association for Clinical Chemistry, Baltimore, MD, June, 1998; Alexandria, VA, 2000.

Chairman, Midwest Association of Toxicology and Therapeutic Drug Monitoring (MATT) annual meeting, Indianapolis, IN, April, 1997.

Chairman, 18th International Symposium on Column Liquid Chromatography, Minneapolis, MN, May, 1994.

Associate member, Commission on Nomenclature, Properties, and Units, International Union of Pure and Applied Chemistry, 1995 - present.

Representative, Joint Committee on Education in Toxicology (AACC; SOFT; CAT), 1996-1999.

Award for Outstanding Contributions to Clinical Chemistry in a Selected Area of Research, American Association for Clinical Chemistry, 1990.

Board of Editors, ***Therapeutic Drug Monitoring***, 1992-present.

Faculty Member, AACC course ***Professional Practice in Toxicology: A Review***, Cincinnati, OH, June 21-25, 1992; June 21-25, 1993; June 20-24 1994; and June 23-26, 1996.

Board of Directors, American Association for Clinical Chemistry, 1989-1991.

Board of Directors, American Board of Clinical Chemistry, 1985-91.

Co-chairman, Selected Topics, AACC/CSCC/IFCC International Meeting. San Francisco, CA, July, 1990.

National Science Foundation Special Molecular Sciences Review Panel, NSF Science and Technology Center Initiative, April, 1988.

Leroy Sheldon Palmer Award in Chromatography, Minnesota Chromatography Forum, 1985.

### **SELECTED RESEARCH PUBLICATIONS, REVIEWS, AND CHAPTERS**

R.L. Hilderbrand, R. Wanninger, and L.D. Bowers, "An update on regulatory issues in anti-doping programs in sport." *Curr Sports Med Rep* 2003; 2: 226-32.

L.D. Bowers, "Abuse of performance enhancing drugs in sport." *Ther. Drug Monit.* 2002; 24: 178-81.

L.D. Bowers and D.J. Borts, "Direct measurement of testosterone and epitestosterone conjugates in urine with HPLC/MS/MS." *J. Mass Spectrom.* 2000; **35**: 50-61.

L.D. Bowers, R.S. Black, and D.J. Borts, "Athletic Drug Testing: An Analyst's View of Science and the Law." *Ther. Drug Monit.* 2000; 22: 98-102.

R.S. Black and L.D. Bowers, Mass spectrometric characterization of the  $\beta$ -subunit of human chorionic gonadotropin," in *Protein and Peptide Analysis: New Mass Spectrometric Applications*, J.R. Chapman, ed., (Humana Press, Towanda, NJ, 2000) 337-54.

L.D. Bowers, "Oral dehydroepiandrosterone supplementation can increase the testosterone/epitestosterone ratio." *Clin Chem* 1999; 45: 295-297.

L.D. Bowers, "Anabolic agents and sports." *Therapeutic Drug Monitoring and Toxicology* 1998; 19: 303-19. (American Association for Clinical Chemistry continuing education peer-reviewed publication).

L.D. Bowers, "Athletic Drug Testing," *Clinics in Sports Medicine* 1998; 17: 299-318.

D.A. Ullman, L.D. Bowers, and C.A. Burtis, "Chromatography," in *Teitz Textbook of Clinical Chemistry, 3rd ed*, C.A. Burtis and E. Ashwood, eds., (Saunders, Philadelphia, 1998) 164-204.

L.D. Bowers, "Analytical goals in therapeutic drug monitoring." *Clin. Chem.* 1998; **44**: 375-80.

L.D. Bowers, "Analytical advances in detection of performance-enhancing compounds." *Clin. Chem.* 1997; **43**: 1299-1307.

C. Liu and L.D. Bowers, "Mass spectrometric characterization of nicked fragments of the  $\beta$ -subunit of human chorionic gonadotropin" *Clin. Chem.* 1997; **43**: 1172-81.

L.D. Bowers and D.J. Borts, "Evaluation of selected ion storage ion trap mass spectrometry for detection of urinary anabolic agents." *Clin. Chem.* 1997; **43**: 1033-40

C. Liu and L.D. Bowers, "Mass spectrometric characterization of the  $\beta$ -subunit of human chorionic gonadotropin" *J. Mass Spectrom.* 1997; **32**: 33-42.

L.D. Bowers and D.J. Borts, "Separation and confirmation of anabolic steroids with quadrupole ion trap tandem mass spectrometry." *J. Chromatogr.* 1996; **687**: 69-78.

C. Liu and L.D. Bowers, "Immunoaffinity trapping of urinary human chorionic gonadotropin and its high-performance liquid chromatographic-mass spectrometric confirmation." *J. Chromatogr.* 1996; **687**: 213-220.

L.D. Bowers, and Sanaullah, "Direct measurement of steroid sulfate and glucuronide conjugates with high-performance liquid chromatography-mass spectrometry." *J. Chromatogr.* 1996; **687**: 61-68.

Sanaullah and L.D. Bowers, "Facile synthesis of [16,16,17-<sup>2</sup>H<sub>3</sub>]-testosterone and -epitestosterone and their glucuronides and sulfates." *J. Steroid Biochem. Molec. Biol.* 1996; **58**: 225-34.

L.D. Bowers, "Coupled Mass Spectrometric-Chromatographic Systems," in *Handbook of Analytical Toxicology*, S. Wong and I. Sunshine, eds., (CRC Press, Boca Raton, 1996), 173-199.

D.A. Ullman, L.D. Bowers, and C.A. Burtis, "Chromatography," in *Teitz Fundamentals of Clinical Chemistry, 4th ed*, C.A. Burtis and E. Ashwood, eds., (Saunders, Philadelphia, 1996), 105-123.

W.C. Buss and L.D. Bowers, "The dose-dependent inhibition of rat renal translation elongation seen after *in vivo* cyclosporin A is not caused by cyclosporin metabolites." *Toxicology* 1995; **100**: 17-25.

S. Weisdorf, K. Hendrich, H. Liu, J. Wike, H. Merkle, L. Bowers, K. Ugurbil, "An *in vivo* <sup>31</sup>P magnetic resonance spectroscopy study of uridine excess in rats fed orotic acid." *Biochem. Molec. Med.* 1995; **54**: 43-52.

M.A. Lacerda, L.D. Bowers, D.C. Snover, W.D. Payne, and J.R. Bloomer, "Hepatic levels of Cyclosporine and metabolites in patients after liver transplantation." *Clin Transplantation* 1995; **9**: 35-38.

S.A. Gruber, J. Hewitt, A.L. Sorenson, D.L. Barber, L.D. Bowers, G. Rynders, L. Arrazola, A.J. Matas, M.E. Rosenberg, and D.M. Canafax, "Pharmacokinetics of FK-506 following intravenous and oral administration in patients awaiting renal transplantation." *J. Clin. Pharmacol.* 1994; **34**: 859-64.

D.A. Whitman, V. Abbott, K. Fregien, and L.D. Bowers, "Recent advances in HPLC/MS and HPLC/MS/MS: Detection of Cyclosporine and metabolites in kidney and liver tissue." *Ther Drug Monit* 1993; **15**: 552-6.

W.D. Branton, M.S. Rudnick, Y. Zhou, E.D. Eccleston, G.B. Fields, L.D. Bowers, "Fatty acylated toxin structure" *Nature* 1993; **365**: 496-7.

D.J. Waters, L.D. Bowers, R.J. Cipolle, D.D. Caywood, R.L. Bill, "Plasma salicylate concentrations in immature dogs following aspirin administration: Comparison with adult dogs." *J Vet Pharmacol Ther.* 1993; **16**: 275-82.

L.D. Bowers, D.A. Ullman, and C.A. Burtis, "Chromatography," in ***Teitz Textbook of Clinical Chemistry, 2nd ed***, C.A. Burtis and E. Ashwood, eds., (Saunders, Philadelphia, 1993), 206-255.

I. Fu and L.D. Bowers, "Micro-quantitation of Cyclosporine and its metabolites and determination of their spectral absorptivities." *Clin. Chem.* 1991; **37**: 1185-1190.

J.A. Halikas, R.D. Crosby, G.A. Carlson, F. Crea, N.M. Graves, and L.D. Bowers, "Cocaine reduction in unmotivated crack users using carbamazepine versus placebo in a short term, double-blind crossover design." *Clin. Pharm. Ther.* 1991; **50**: 81-95.

L.D. Bowers, "Therapeutic monitoring of cyclosporine: Difficulties in establishing a therapeutic window." *Clin. Biochem.* 1991; **24**: 81-8.

R. Yatscoff, T.G. Rosano, and L.D. Bowers, "Clinical significance of cyclosporine metabolites." *Clin. Biochem.* 1991; **24**: 23-36.

L.D. Bowers, "Cyclosporine analysis by HPLC: Precision, accuracy, and minimum detectable quantity." *Transpl. Proc.* 1990; **22**: 1150-1154.

L.D. Bowers, D.D. Norman, X.-x. Yan, D. Scheeler, and K.L. Carlson, "Isolation and structural identification of <sup>9</sup>hydroxy- <sup>9</sup>desmethyl-cyclosporine." *Clin. Chem.* 1990; **36**: 1875-1879.

S. Pedigo and L.D. Bowers, "Solvatochromic comparison of alkyl-silica-based and polystyrene- divinylbenzene reversed phase columns." *J. Chromatogr.*, 1990; **499**: 279-290.

P.O. Edlund, L.D. Bowers, T. Covey, and J.D. Henion, "Rapid determination of dianabol in equine urine by isotope dilution liquid chromatography tandem mass spectrometry." *J. Chromatogr.*, 1989; **497**: 49-57.

L.D. Bowers, "High performance liquid chromatography/mass spectrometry: State of the art for the drug analysis laboratory." *Clin. Chem.* 1989; **35**: 1282-1287.

P. O. Edlund, L.D. Bowers, and J.D. Henion, "Determination of dianabol and its metabolites in equine plasma and urine by coupled-column liquid chromatography and tandem mass spectrometry," *J. Chromatogr.*, 1989; **487**: 341-356.

P.W. Carr and L.D. Bowers, ***Immobilized Enzymes in Analytical and Clinical Chemistry: Applications and Fundamentals*** (Wiley-Interscience, New York, 1980), 1-460.

## **SELECTED PRESENTATIONS AT SCIENTIFIC MEETINGS**

*L.D. Bowers*, “Mass Spectrometry in Clinical Diagnosis of Disease,” American Association for Clinical Chemistry, San Francisco, CA, July, 2000.

*L.D. Bowers*, “Testing for Performance Enhancing Drugs in Sports,” American Society of Clinical Laboratory Scientists, San Francisco, CA, July, 2000.

*L.D. Bowers*, “Analytical Toxicology Issues in the Fight Against Drugs in Athletics” University of Utah, Salt Lake City, UT, May, 2000.

*L.D. Bowers*, “LC/MS/MS in Clinical Toxicology,” Analytica Congress, Munich, Germany, April, 2000.

*L.D. Bowers*, “Detection of Performance-enhancing Drugs in Athletics: An Analytical Adventure” University of Saarland, Homburg/Saar, Germany April, 2000.

*L.D. Bowers*, “Dietary Supplements: What’s Going on Out There?” Indiana Athletic Trainers Association, Indianapolis, IN, October, 1999.

*L.D. Bowers*, “Athletic Drug Testing - An Analysts View of Science and the Law”, 6th International Congress of Therapeutic Drug Monitoring and Clinical Toxicology, Cairns, Australia, September, 1999

*L.D. Bowers*, HPLC/MS/MS Workshop, 6th International Congress of Therapeutic Drug Monitoring and Clinical Toxicology, Cairns, Australia, September, 1999

*L.D. Bowers*, “Detection of Performance-enhancing Drugs in Athletics: An Analytical Adventure” Miami University (Ohio), OH, February, 1999.

*L.D. Bowers*, “” Plenary lecture; Mass Spectrometry in Clinical Diagnosis of Disease, 11<sup>th</sup> American Society for Mass Spectrometry Sanibel Conference, Sanibel Island, FL, January, 1999.

*L.D. Bowers*, “Athletes, Drugs and the Courts: An Analyst’s Perspective” Ball State University, February, 1998.

*L.D. Bowers*, “Athletes, Drugs and the Courts: An Analyst’s Perspective” Indiana Section, American Chemical Society, Indianapolis, IN February, 1998.

*L.D. Bowers*, “Drug Testing and the Elite Athlete” New York State Academy of Family Physicians Annual Meeting, Lake Placid, NY, January, 1998.

*L.D. Bowers*, “Applications of Chromatography/MS/MS in Toxicology.” 5th International Congress of Therapeutic Drug Monitoring and Clinical Toxicology, Vancouver, BC, Canada, November, 1997.

*L.D. Bowers*, “Why Sample Spectra and Library Spectra Don’t Match: An Overview of Mass Spectral Interpretation and Library Searching” (Workshop) Society of Forensic Toxicologists Meeting, Salt Lake City, UT, October, 1997.

- L.D. Bowers*, "Studying Phase II Metabolism of Steroids with HPLC/MS/MS" (Workshop) Society of Forensic Toxicologists Meeting, Salt Lake City, UT, October, 1997.
- L.D. Bowers*, "Analytical Goals in Therapeutic Drug Monitoring" American Association for Clinical Chemistry Annual Meeting, Atlanta, GA, July, 1997.
- L.D. Bowers*, "Forensic Urine Drug Testing/Doping Control in Sports Medicine: Tandem Mass Spectrometry for Steroid Drug Analysis." Pittsburgh Conference, Atlanta, GA, March, 1997.
- L.D. Bowers* and Sanaullah, "Direct Measurement of Testosterone and Epitestosterone Glucuronides and Sulfates by HPLC/MS/MS." Society of Forensic Toxicologists, Denver, CO, October, 1996.
- L.D. Bowers*, "Decreasing the Detection Threshold: Application of GC/ and HPLC/Mass Spectrometric Techniques." International Federation of Clinical Chemistry, London, England, July, 1996.
- L.D. Bowers*, "Endocrine System Manipulation in Athletes." 31st Academy of Clinical Laboratory Physicians and Scientists meeting, St. Louis, MO, June, 1996
- L.D. Bowers*, "Detection of Endocrine System Manipulation in Athletes." Medical College of Virginia, Richmond, VA, April, 1996.
- L.D. Bowers*, "Detection of Endocrine System Manipulation in Athletes." University of Utah, Salt Lake City, UT, April, 1996.
- L.D. Bowers*, "Analytical Challenges in Athletic Drug Testing for International Competition," (Keynote Speaker), Minnesota Chromatography Forum, Minneapolis, MN, April, 1996.
- L.D. Bowers* "Fundamentals of Quadrupole Ion Traps" 14th Cologne Workshop of Doping in Sport, Cologne, Germany, March, 1996.
- L.D. Bowers* "Ion Trap MS/MS for Confirmation of Anabolic Steroids" 14th Cologne Workshop of Doping in Sport, Cologne, Germany, March, 1996.
- L.D. Bowers* "Confirmation of hCG in Urine using Immunoprecipitation and HPLC/MS" 14th Cologne Workshop of Doping in Sport, Cologne, Germany, March, 1996.